

## **II. REMARKS**

### **A. Introductory Remarks**

Reconsideration and allowance of this application is earnestly requested. Claims 1-35 are pending in this application. Claims 1, 3, 12, 24, 25, 26, 27 and 30 are currently amended for scope and clarity. No new matter has been added by these amendments. Claims 29, 31-35 are allowed. Claims 1-28 and 30 are rejected under 35 U.S.C. §103.

### **B. Rejection of Claims 1-13, 17-23 and 24-28 Under §103(a) Over Leon In View of Gogg Should Be Withdrawn**

The Office Action dated August 23, 2006 rejected claims 1-13, 17-23 and 24-28 under 35 U.S.C. §103 as allegedly obvious over U.S. Patent 6,030,932 (“Leon”) in view of U.S. Patent 6,686,297 (“Gogg”) for the reasons cited on the following pages. Applicants respectfully traverse these rejections.

As stated by the Federal Circuit, “*a proper analysis under 35 U.S.C. §103 requires, inter alia, consideration of two factors: (1) whether the prior art would have suggested to those of ordinary skill in the art that they should make the claimed composition or device, or carry out the claimed process; and (2) whether the prior art would also have revealed that in so making or carrying out, those of ordinary skill would have a reasonable expectation of success.*” *In re Vaeck*, 947 F. 2d 488, 493 (Fed. Cir. 1991). In addition, the prior art references must teach or suggest all the claim limitations. The teaching or suggestion to combine and the reasonable expectation of success must be found in the prior art, and not in the applicants’ disclosure. *Id.* at 493. *See, also* MPEP §2142. Further, the Federal Circuit recently held “[t]he best defense against the subtle but powerful attraction of hindsight-based obviousness is rigorous application of the requirement for a showing of the teaching or motivation to combine prior art references.” (*In re Lee*, 61 U.S.P.Q.2d 1430, 1433 (Fed. Cir. 2002), quoting from *In re Dembiczak*, 50 U.S.P.Q. 2d 1614, 1617 (Fed Cir. 1999)). Applicants respectfully submit that the references of Leon, Gogg, Herdt, and Skee cited in the Office Action fail to meet the tests prescribed by the Federal Circuit as discussed below.

## **1. Invention of Claims 1 and 24**

Applicants respectfully submit that independent claims 1 and 24 are directed to an aqueous semiconductor cleaning solution. Amended claim 1 recites a composition having a pH between about 1.5 and about 6 and comprising: at least about 75% by weight water and an organic solvent; from about 0.5% to about 10% by weight phosphoric acid; optionally one or more other acid compounds; optionally one or more fluoride-containing compounds; and at least one alkaline compound selected from the group consisting of a trialkylammonium hydroxide and/or a tetraalkylammonium hydroxide, a hydroxylamine derivative, and an alkanolamine. The formulas for the hydroxylamine derivative and for the alkanolamine are not included above to aid readability, but can be found in ¶[0057], ¶[0059], and claim 1 respectively.

Similarly, independent claim 24 recites a dilute aqueous semiconductor cleaner and residue remover having a pH between about 1.5 and about 6 and comprising: a mixture of water and one or more polar organic solvents, present in an amount of at least about 75% by weight; phosphoric acid or salt thereof, present in an amount from about 0.1% to about 6% by weight of 85% phosphoric acid; and hydroxylamine or a hydroxylamine derivative, present in the solution in an amount from about 0.1% to about 5% by weight not including the counterion of the hydroxylamine derivative salt, if present. Claim 24 also recites as optional ingredients a) a tri-alkylammonium hydroxide and/or tetra-alkylammonium hydroxide, present in the solution in an amount from about 0.2% to about 5% by weight; b) an alkanolamine, present in the solution in an amount from about 0.2% to about 5% by weight; c) a fluoride-containing compound, present in the solution in an amount from about 0.001% to about 0.5% by weight; d) an other acid compound, present in the solution in an amount from about 0.05% to about 6% by weight; e) a chelating agent, present in the solution in an amount from about 0.1% to about 8% by weight; and f) a surfactant, present in the solution in an amount from about 0.01% to about 3% by weight.

## **2. What Leon Discloses**

Leon discloses a cleaning composition comprising: 1) water; 2) a fluorine-containing compound; and 3) either a compound selected from an amine, a quaternary ammonium compound, and ammonium hydroxide, or a hydroxylamine or a salt thereof. *See* Leon Abstract. Further, Leon discloses selected alkanolamines. *See* col. 5 lines 31-33. Leon also discloses

selected organic acids in particular lactic acid, gallic acid, and gallic acid esters, chelating agents, stabilizers, corrosion inhibitors, surfactants, ozonated water, which can be admixed into his composition. *See* col. 5 lines 54 through col. 6, lines 63.

### **3. What Leon Fails to teach**

In contrast to independent claim 1, Leon does not teach or suggest the following limitations: 1) at least about 75% by weight water and an organic solvent; 2) from about 0.5% to about 10% by weight phosphoric acid; 3) a hydroxylamine derivate with the structural formula in claim 1 and alkanolamines with the structural formula in claim 1. Further, Leon does not teach or suggest using a pH adjusting compounds to obtain the desired pH. Leon simply discloses a pH of 2-9 is desired such as to minimize attack on metal layers. *See* Leon col. 5 lines 13-21.

Moreover, in contrast to independent claim 24, Leon does not teach or suggest the following limitations: 1) a mixture of water and one or more polar organic solvents, present in an amount of at least about 75% by weight; 2) phosphoric acid or salt thereof, present in an amount from about 0.1% to about 6% by weight of 85% phosphoric acid; 3) hydroxylamine derivative, present in the solution in an amount from about 0.1% to about 5% by weight not including the counterion of the hydroxylamine derivative salt. In fact, Leon teaches away from using an organic solvent. Leon, col. 3, lines 60-65.

### **4. What Gogg Discloses**

Gogg discloses a method of manufacturing an electronic device in which method a substrate is placed inside a process chamber and a surface of the substrate is subjected to an ozone treatment comprising the steps of: providing a liquid onto the surface of the substrate via first supply means, introducing a solution comprising a liquid carrier solvent and ozone gas into the process chamber via second supply means without bringing direct contact between solution and the surface of the substrate. *See* Gogg abstract. By supplying ozone gas via a separate solution, Gogg addresses the problem of high temperature “ozone treatment” process of contacting a substrate with a liquid at elevated temperature and beneficially having a high concentration of ammonium hydroxide and optionally other additives which are compatible with the ozone gas, while also providing a high concentration of ozone. *See* Gogg at column 1, lines 38-46, and at column 2, lines 3-18.

Gogg also discloses adding additives to target certain contaminants and “to enhance the effectiveness of the cleaning.” *See* Gogg at column 1, lines 23-31, and at column 3, lines 51-53. Gogg suggests additives such as: 1) an acid, giving examples which are hydrofluoric acid (HF) or phosphoric acid; 2) a base, of which the only example given is ammonium hydroxide; or 3) a mixture of an acid and a base. *See* Gogg at column 1, lines 23-31, and at column 3, lines 51-57. Additionally, Gogg discloses ozone gas stabilizing agent may be used such as acetone, acetic acid, H<sub>3</sub>PO<sub>4</sub> (phosphoric acid). *See* col. 5 lines 20 to 27.

## **5. What Gogg Fails to Disclose**

In contrast to independent claim 1, Gogg fails to teach or suggest the following limitations: 1) an aqueous semiconductor cleaning solution having a pH between about 1.5 and about 6; 2) at least about 75% by weight water and organic solvent; 3) from about 0.5% to about 10% by weight phosphoric acid; 4) at least one alkaline compound selected from the group consisting of: a trialkylammonium hydroxide and/or a tetraalkylammonium hydroxide; a hydroxylamine derivative having the structural formula shown in claim 1.

Further, in contrast to independent claim 24, Gogg fails to teach or suggest the following limitations: 1) a dilute aqueous semiconductor cleaner and residue remover having a pH between about 1.5 and about 6; 2) a mixture of water and one or more polar organic solvents, present in an amount of at least about 75% by weight; 3) phosphoric acid or salt thereof, present in an amount from about 0.1% to about 6% by weight of 85% phosphoric acid; 4) hydroxylamine or a hydroxylamine derivative, present in the solution in an amount from about 0.1% to about 5% by weight not including the counterion of the hydroxylamine derivative salt, if present; 5) optionally, a tri-alkylammonium hydroxide and/or tetra-alkylammonium hydroxide, present in the solution in an amount from about 0.2% to about 5% by weight; 6) optionally, an alkanolamine, present in the solution in an amount from about 0.2% to about 5% by weight.

Moreover, Gogg does not teach compositions having both hydrofluoric acid (HF) and phosphoric acid. Gogg does not recommend phosphoric acid for cleaning purposes, that is, for removal of contaminants, organics, and particles. As mentioned *supra*, Gogg discloses phosphoric acid in the context of enhancing the “ozone treatment” process, adjust the pH, and to stabilize ozone gas. *See* Gogg col. 3 lines 51-56 and col. 5 lines 20 to 27.

6. **No Motivation or Suggestion to Modify or Combine Leon and Gogg**

Applicants respectfully submit that there is no suggestion or motivation in either Leon or Gogg to modify the references or to combine their teachings to arrive at the invention of claims 1 and 24. As discussed above, Gogg is directed to method of manufacturing an electronic device in using “ozone treatment.” By supplying ozone gas via a separate solution, Gogg addresses the problem of high temperature “ozone treatment” process of contacting a substrate with a liquid at elevated temperature and beneficially having a high concentration of ammonium hydroxide and optionally other additives which are compatible with the ozone gas, while also providing a high concentration of ozone.

Contrary to the assertion in the Office Action that it would have been obvious to one of ordinary skill in the art to modify Leon with Gogg by introducing phosphoric acid in order to efficiently control or adjust the pH of the cleaning composition for increasing the effectiveness of the cleaning composition as taught by Gogg, Applicants respectfully submit that there is no motivation or suggestion in Gogg or Leon to combine their teachings for a number of reasons. First, unlike Leon, Gogg is not concerned with a cleaning composition. Gogg is concerned with a high temperature “ozone treatment” process. Second, Leon does not suggest using any pH adjusting compounds and the Office Action relies on hindsight to provide a pH adjusting compound, namely phosphoric acid to Leon’s composition. Instead, Leon at column 5, lines 13-21, expressly teaches:

*the components in the cleaning composition **should be admixed in appropriate concentrations** to provide a composition having a pH with a preferred range from about 2 to 9, and more preferably from about 2 to 6. [emphasis added]*

See also Leon at column 6, lines 30-35. From reading Leon, it becomes clear to one skilled in the art that there is no need for a mineral acid such as phosphoric acid for Leon to adjust his pH because Leon adjusts the pH of his composition with a balanced amount of the acidic fluorine-containing compounds and the alkaline amine or hydroxylamine compounds. Further, Leon uses selected organic acids, in particular lactic acid, gallic acid, and gallic acid esters, which can be admixed into the composition of Leon, which can also play a role in adjusting the pH.

The Office Action implies that one of ordinary skill in the art would look elsewhere for a mineral acid to adjust the pH of Leon's composition. By turning to Gogg, the Office Action is disregarding the teaching of Leon, implying that there is a need for mineral acid such as phosphoric acid to adjust the pH in Leon's composition. Gogg teaches HF or phosphoric acid in ozonated water, where HF is useful to enhance cleaning, and phosphoric acid is useful as a pH adjustor that is a particularly good ozone stabilizer. Thus, the reconstruction in the Office Action ignores Leon's teaching of balanced proportions of hydroxylamines/amines and acidic fluorides, suggesting one of skill in the art would merely add a pH adjustor. This is contrary to the teaching of Leon because Leon teaches that the concentration of an *acidic fluoride and an amine* are balanced to obtain the requisite pH of his solution.

Third, Gogg also does not provide any motivation to be combined with Leon. Gogg addresses the problem of "ozone treatment" of a substrate by contacting a substrate with a water at elevated temperature and beneficially having a high concentration of ammonium hydroxide and optionally other additives which are not repugnant to ozone, while also providing a high concentration of ozone. *See* Gogg at column 1, lines 38-46, and at column 2, lines 16-18. As discussed *supra*, Gogg does not teach compositions having both HF and phosphoric acid. Unlike the recitations of claims 1 and 24, Gogg does not recommend phosphoric acid for cleaning purposes, that is, for removal of contaminants. Although Gogg discloses phosphoric acid, Gogg does not suggest or recommend phosphoric acid or a buffer of phosphoric acid for cleaning purposes as defined in claims 1 and 24. Rather, Gogg suggest hydrofluoric acid or phosphoric acid primarily in the context of high temperature "ozone treatment" as an ozone stabilizer and secondarily in the context of mixing with other amines for adjusting the pH of the solution. *See* Gogg, column 5, lines 15-27 and col. 5, lines 52-57.

Fourth, the combination of Leon and Gogg could have been achieved only with the benefit of *hindsight* provided by Applicant's own invention, which of course is *impermissible*. The fact that a claimed product is within a broad field of prior art and one might arrive at it by selecting specific items and conditions, does not render the product obvious in the absence of some directions or reasons in the prior art for making such selections. (*Ex Parte Kuhn*, 132 U.S.P.Q. 359 (1961). Prior art references in combination do not make an invention obvious unless something in the prior art references would suggest the advantage to be derived from their

combined teachings. In re Sernaker, 217 U.S.P.Q. 1, 6 (Fed. Cir. 1983). One simply cannot pick and choose among individual parts of assorted references to form a mosaic to recreate a facsimile of the claimed invention. AKZO N.V. v. International Trade Commission, 1 USPQ.2d 1241, 1246 (Fed. Cir 1986). Uniroyal v. Rudkin-Wiley, 5 USPQ. 2d 1434, 1438 (Fed. Cir. 1988).

In the present case, Applicants contend that the Office Action combines selected portions of Leon with selected portions of Gogg in classic hindsight-based reconstructions of the invention of claims 1 and 24. The Office Action has simply done no more than find the separate elements of the Applicants' invention and assert that broad disclosures, which would require specific selection and experimentation to achieve the invention of claims 1 and 24, render the present invention obvious. If motivation were to exist, *which it does not*, one would not be motivated to select specific characteristics of Gogg and use it in combination with Leon given their distinctly different purposes with the expectation that they would provide the composition of the claimed invention. Indeed, the statutory standard of 35 U.S.C. §103 is whether the invention, considered as a whole, would have been obvious to one of ordinary skill in the art, *not whether it would have been obvious for one of ordinary skill in the art to try various combination*. AKZO N.V. v. International Trade Commission, 1 USPQ.2d 1241, 1246 (Fed. Cir 1986).

Leon teaches an aqueous composition with a balanced amount of acidic fluorine-containing compounds and alkaline amine or hydroxylamine compounds, where the proportions of the compounds are such that the pH is 2-9. The composition of Leon contains no ozone – if ozonated water is used, it is a deionized ozonated water rinse. Gogg teaches HF or phosphoric acid in ozonated water, where HF is useful to enhance cleaning, and phosphoric acid is useful as a pH adjuster that is also a particularly good ozone stabilizer. The composition of Gogg has neither hydroxylamines nor amines. The only ingredients Leon and Gogg have in common in their primary solutions are water and acidic fluorides. When faced with Gogg's teaching to use acidic fluorides to provide added cleaning power or phosphoric acid to stabilize ozone, the Office Action suggests that one of skill in the art would choose the phosphoric acid (the ozone stabilizer) over the acidic fluoride (which is a cleaner enhancer, as is also taught by Leon) to adjust the pH of the composition. This is contrary to Leon's teaching because Leon expressly

formulate a pH balanced composition comprising the acidic fluoride and the amines. Therefore, it is Applicants position that the Office Action has not provided any reasonable motivation for the combination of the references, and has shown no motivation for selecting the specific percentages and the specific components defined by claims 1 and 24.

Sixth, the compositions of claims 1 and 24 can advantageously provide both cleaning efficiency and material compatibility unlike that of Leon. It is believed that the cleaning ability of the preferred solutions according to the invention is probably due mainly to the chelating properties and dissolution ability of the other acid components in combination with phosphoric acid. See specification on page 14, paragraph [0086]. Accordingly, one skilled in the cleaning art semiconductor surfaces, who is familiar with Leon, would not look to Gogg, in part because Gogg is concerned with method of manufacturing an electronic device using a high temperature “ozone treatment” process to solve problems relating to cleaning plasma etch residue from semiconductor substrates. The nexus between Leon and Gogg is at best tenuous, because neither Leon nor Gogg teach or suggest phosphoric acid for chemical cleaning of the plasma etch residue. Thus, for all the foregoing reasons, Applicants respectfully submit that there is no teaching, suggestion or motivation in either Leon or Gogg to render obvious independent claims 1 and 24. Accordingly, Applicants respectfully requests withdrawal of this rejection.

#### **7. Combination of Leon and Gogg Fails to Teach All Elements of Claims 1 and 24**

Applicant submits that even if there was suggestion or motivation to combine Leon and Gogg — *which as discussed supra there is not*— the combination does not teach all the limitations of the invention of claims 1 and 24. With respect to claim 1, the combination of Leon and Gogg fails to teach or suggest the following limitations: 1) at least about 75% by weight water and organic solvent; 2) from about 0.5% to about 10% by weight phosphoric acid; and 3) a hydroxylamine derivate with the structural formula in claim 1, and wherein the at least one alkaline component comprises a hydroxylamine derivative present in an amount from about 0.3% to about 1% by weight

Similarly, with respect to claim 24, the combination of Leon and Gogg fails to teach the following limitations: 1) a polar solvent selected from a mixture of water and one or more polar organic solvents, present in an amount of at least about 75% by weight; 2) phosphoric acid or salt



thereof, present in an amount from about 0.1% to about 6% by weight of 85% phosphoric acid; 3) hydroxylamine derivative, present in the solution in an amount from about 0.1% to about 5% by weight not including the counterion of the hydroxylamine derivative salt.

Further, Leon does not teach or suggest using a pH adjusting compounds to obtain the desired pH. Leon simply discloses a pH of 2-9 is desired such as to minimize attack on metal layers. *See* Leon col. 5, lines 20-21. Similarly, Gogg teaches a high temperature “ozone treatment” process that utilizes a liquid having a high concentration of ammonium hydroxide and optionally other additives such as hydrofluoric acid or phosphoric acid, which are compatible with the ozone gas to stabilize the gas and to enhance the “ozone treatment” process.

Even assuming, *arguendo*, that Gogg teaches the potential use of phosphoric acid in Leon’s cleaning composition, Applicants respectfully submit that Gogg still does not remedy the deficiencies of Leon with respect to independent claims 1 and 24. Independent claim 1 recites 0.5% to 10% of phosphoric acid. There is no teaching in either Leon or Gogg on any amount of phosphoric acid to be included. Contrary to the assertion that “it would have been obvious to optimize as the optimization of a result effective variable involves only routine experimentation” Applicants submit that this rationalization is improper because Gogg teaches phosphoric acid to stabilize ozone and not in the cleaning process. How would one on ordinary skill in the art test to find an optimum amount of phosphoric acid? There is no ozone in the recited compositions that needs stabilizing, and if there was, there is no teaching in the references that the amount of phosphoric acid needed to optimally stabilize the ozone would fall within the claimed range.

The routine experimentation could not be used to optimize cleaning mainly because phosphoric acid is not taught by the references to promote cleaning. The routine experimentation might be to optimize cleaning while minimizing metal corrosion and pitting - Applicants optimized their compositions by testing plasma etch residue removal, corrosion, and pitting of titanium nitride/ aluminum-copper alloy/titanium-titanium nitride/silica wafers as described in the instant application at ¶[0094]. Further, while Applicants found that all the described formulations were non-corrosive, the more informative test was pitting. *See* the instant application at ¶[0094]. But that would be using the Applicant’s own disclosure in hindsight reconstruction of the invention. Leon teaches his compositions are non-corrosive in column 1 lines 9-14, but does not teach which substrates that his compositions are non-corrosive toward.

Leon does not consider metal pitting. Gogg does not mention metal pitting, but only states at column 3 lines 62-64 that ozone gas prevents pitting of silicon by ammonium hydroxide. Of course, neither ozone nor ammonium hydroxide is present in the composition of claim 1, and pitting of silicon is unrelated to pitting of metals. Therefore, the routine experimentation would not have realized the invention of claims 1 and 24.

Moreover, contrary to the assertion in the office action that the amount of phosphoric acid is that amount sufficient to obtain the desired pH, Applicants submit that the amount of phosphoric acid needed to obtain the desired pH is dependent on the amount of basic material such as quaternary ammonium compounds AND on the amount of other acidic material such as HF. Claim 24 recites between 0.1% and 5% of the amine, hydroxylamine, or tertiary or quaternary ammonium compound. Further, Applicants optimized with a composition of at most 0.001% to about 0.5% by weight of a fluoride-containing compound, while Leon teaches 0.5% to 10%. There is no reason to suspect that routine experimentation at the very bottom of the range of fluoride-containing compound taught by Leon would result in the optimization to the values recited in claim 24, especially in view that the compositions in claim 24 were tested against materials not taught or suggested in either prior art reference, and since the most informative test – metal pitting – is not taught or suggested in either prior art references.

Clearly, the combination of Leon and Gogg fail to teach several elements of independent claims 1 and 24. Thus, there is no valid basis to combine these references but, even if the references are combined, the applicants' invention does not result. Therefore, because the combination of Leon and Gogg fails to render obvious the subject matter of claims 1 and 24, Applicant requests withdrawal of this rejection as to these claims and to the corresponding claims that depend therefrom.

Further, as previously noted, Leon teaches away from compositions use an organic solvent. See, Leon, Col. 3, lines 60-65. It is improper to combine references where the references teach away from their combination. In re Grasselli, 713 F.2d 731, 743, 218 USPQ 769, 779 (Fed. Cir. 1983) (The claimed catalyst which contained both iron and an alkali metal was not suggested by the combination of a reference which taught the interchangeability of antimony and alkali metal with the same beneficial result, combined with a reference expressly excluding antimony from, and adding iron to, a catalyst.) Gogg uses a carrier solvent, which

could be an organic solvent. Accordingly, Gogg should not be combined with Leon. Because the presently claimed invention claims an organic solvent, Leon teaches away from the presently claimed invention as well.

**C. Rejection of Claims 1-5, 7-8, 14-16 Under §103(a) Should Be Withdrawn**

Claims 1-5, 7-8, 14-16 stand rejected under 35 U.S.C. § 103(a) as allegedly being obvious over U.S. Patent No. 6,121,219 to Herdt *et al.* ("Herdt"), for the reasons set forth on page 4 of the Office Action. Applicants respectfully traverse.

**1. No Suggestion or Motivation in Herdt Because Herd is Non-Analogous Art**

As discussed *supra*, to establish a *prima facie* case of obviousness, three basic criteria must be met. First, there must be some suggestion or motivation, either in the references themselves or in the knowledge generally available to one of ordinary skill in the art, to modify the reference or to combine reference teachings. Second, there must be a reasonable expectation of success. Finally, the prior art reference (or references when combined) must teach or suggest all the claim limitations. The teaching or suggestion to make the claimed combination and the reasonable expectation of success ***must both be found in the prior art and not based on applicant's disclosure.*** *In re Vaeck*, 947 F. 2d 488, 20 U.S.P.Q. 2d 1438 9 Fed. Cir. 1991).

Further, the MPEP states that the examiner must determine what is "analogous prior art" for the purpose of analyzing the obviousness of the subject matter at issue. "In order to rely on a reference as a basis for rejection of an applicant's invention, the reference *must either be in the field of applicants endeavor or, if not, then be reasonably pertinent to the particular problem with which the inventor was concerned.*" *In re Oetiker*, 977 F.2d 1443, 1446, 24 USPQ2d 1443, 1445 (Fed. Cir. 1992). See also *In re Deminski*, 796 F.2d 436, 230 USPQ 313 (Fed. Cir. 1986); *In re Clay*, 966 F.2d 656, 659, 23 USPQ2d 1058, 1060-61 (Fed. Cir. 1992) ("A reference is reasonably pertinent if, even though it may be in a different field from that of the inventor's endeavor, it is one which, because of the matter with which it deals, logically would have commended itself to an inventor's attention in considering his problem."); *Wang Laboratories Inc. v. Toshiba Corp.*, 993 F.2d 858, 26 USPQ2d 1767 (Fed. Cir. 1993); and *State Contracting & Eng'g Corp. v. Condotte America, Inc.*, 346 F.3d 1057, 1069, 68 USPQ2d 1481, 1490 (Fed. Cir.

2003) (where the general scope of a reference is outside the pertinent field of endeavor, the reference may be considered analogous art if subject matter disclosed therein is relevant to the particular problem with which the inventor is involved). *See*, also MPEP 2141.01 (a).

Applicants respectfully submit that Herdt is directed to compositions and methods for cleaning ***organic beverage and food soils to remove carbohydrate and proteinaceous contaminants from hard surfaces in a CIP regimen***. *See, e.g.*, Herdt Abstract and col. 2 lines 35-39. Herdt continually teaches adding sodium and potassium salts as components of his cleaner. *See* Herdt, at column 5 at lines 1-4; at column 5 at lines 19-25; at column 5 at lines 43-48; and at column 6 at lines 33-43. Herdt also teaches at column 4 lines 31-40 that particulate ion exchange material be in the composition. Such particles would be fatal to semiconductor substrates. Nowhere in Herdt is it disclosed, or even suggested, that the compositions of Herdt can be used to clean semiconductor substrates, as recited in instant independent amended claim 1. Absent a suggestion or motivation to modify Herdt to solve the problem in a semiconductor cleaning composition, the invention of amended claim 1 cannot be held obvious.

Indeed, Applicants would have no reason to refer to the cleaners/residue removers of presently amended claim 1 as semiconductor cleaning/residue removing compositions were it not to distinguish them from any other composition of matter. Applicants' characterization is not only an expression of intended use, but more properly is a descriptive element of the compositions that breathes life into presently amended claim 1, as well as those claims depending therefrom. Such cleaners have a number of implicit limitations known to those of ordinary skill in the art, including such limitations such as the stringent metal ion concentration. Thus, Applicants respectfully submit that Herdt does not disclose or suggest all the elements of the rejected claims.

Further, as the art for cleaning organic beverage and food soils to remove carbohydrate and proteinaceous contaminants is clearly not analogous to the semiconductor substrate cleaning art, Applicants respectfully submit that one of ordinary skill in the art would have had no motivation to look to such non-analogous art nor would there be any reasonable expectation of success in applying the compositions of Herdt to semiconductor substrates, in order to attain the invention recited in independent claim 1 as amended. Therefore, in light of the foregoing discussions, Applicants respectfully submit that an obviousness rejection based on Herdt cannot

be maintained and has been overcome. Applicants respectfully request that the obviousness rejection as to claim 1 and to the corresponding dependent claims be withdrawn.

## **2. The Cleaner of Herdt Does Not Meet All Limitations of Claim 1**

Applicant submits that even if there was suggestion or motivation to modify Herdt — *which as discussed supra there is not*— the modification does not teach all the limitations of the invention of claim 1. With respect to claim 1, Herdt fails to teach or suggest the organic solvent limitation. The Examiner did not reject claim 12 in view of Herdt. The limitation of claim 12 has been added to independent claim 1. Accordingly, if Examiner recognizes claim 12 is patentable over Herdt, claim 1 and the claims depending therefrom are also patentable.

Further, with respect to amended claim 1, Herdt does not teach any hydroxylamine compounds. Hydroxylamine compounds have a formula  $N(R_1, R_2, -OR_3)$ , where each R is a hydrogen or an alkyl. None of the quaternary ammonium compounds of Herdt are hydroxylamine compounds. Also, as amended the range of the concentrations of the various components of claim 1 do not overlap or lie inside the ranges disclosed in Herdt.

In its broadest disclosure, Herdt teaches a cleaner concentrate having 0.1-80%  $H_3PO_4$ , 0.1-40% organic acid, 0.1-40% hydrocarbon or ether solvent, 0.1-40% sequestrant, 0.1-40% of an ether amine or quaternary ammonium salt, and 0.1-80% water. The Office Action notes that Herdt at column 3 lines 7-36 that Herdt teaches a pH of 1-5. However, this is not the pH of the cleaner concentrate but is rather the pH of the cleaner composition. *See* Herdt at column 3, lines 15-20. The concentrate formulations of Herdt are provided in Herdt in the Table 1 at column 14, lines 40-49. To make the cleaner, the concentrate composition of Herdt (described in Table 1 in column 14) is diluted with water to provide a 100 ppm to about 20,000 ppm formulation (0.01% to about 2% by weight) of the concentrate in water. *See* Herdt at column 14, lines 50-52. Using the broadest disclosure of Table 1 at column 14 of Herdt with the dilution factor of column 14, lines 50-52, it is readily calculated that the cleaning compositions of Herdt has 0.00001% to 1.6% phosphoric acid, 0.00001% to 0.8% organic acid, 0.00001% to 0.8% solvent, 0.00001% to 0.8% sequestrant, and 0.00001% to 0.8% ether amine or quaternary ammonium compound, wherein the cleaner has at most 2% total of active ingredients. This calculation is based on the broadest disclosure of 0.1-80% phosphoric acid in the concentrate as taught in Table 1 in column 14 of Herdt, which is clearly much different than the preferred range of 0.1% to 40% of

phosphoric acid taught in the preferred composition in said Table 1. Using the preferred composition of the concentrate as taught in Table 1 of Herdt, the actual cleaner of Herdt, which has a pH of 1-5 would have 0.00001% to 0.8% phosphoric acid and 0.00001% to 0.2% of an ether amine or quaternary ammonium compound. Clearly, as amended the composition of claim 1 do not overlap with the ranges disclosed in Herdt.

In view of the foregoing discussion, the prior art of Herdt as a whole fails to suggest or teach one of ordinary skill in the art the desirability of modifying Herdt's composition, much less reasonable expectation of success of such a modification in providing a cleaning composition to be utilized in a semiconductor etch removal and cleaning method. Additionally, *"to establish a prima facie case of obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art."* In Re Royka, 490 F. 3d 981, 180 USPQ 580 (CCPA 1974). Applicant respectfully submits that Herdt does not provide the requisite teaching, suggestion, or motivation to modify his teachings to arrive at the invention of claim amended 1. Therefore, Applicants respectfully submit that claim 1 and the dependent claims 2-5, 7-8, 14-16 that incorporate the limitation of claim 1 are allowable.

#### **D. Rejection of Claims 30 Under §103(a) Should Be Withdrawn**

Claim 30 stands rejected under 35 U.S.C. § 103(a) as being obvious over U.S. Patent No. 6,465,403 to Skee ("Skee"), for the reasons set forth on pages 6 of the Office Action. Applicants respectfully traverse.

##### **1. What Skee Discloses**

Skee teaches aqueous alkaline compositions useful in the microelectronics industry for stripping or cleaning semiconductor wafer substrates by removing photoresist residues and other unwanted contaminants. *See*, Abstract. Skee's compositions typically contain (1) one or more metal ion-free bases at sufficient amounts to produce a pH of 10-13, (2) about 0.01 to 5% by weight a water-soluble metal ion-free silicate, (3) water, (4) optionally about 0.01 to about 2% by weight chelating agents, optionally about 1% to about 30% by weight organic co-solvents, optionally about 1% to about 30% by weight titanium residue removal enhancing agents, and optionally about 0.01 to about 0.5% by weight surfactants. *See*, column 5, line 30-52, col. 6, lines 15-45. *See*, also col. 5, line 30-52, col. 6, line 15-45.

## **2. What Skee Fails to Disclose**

Skee, however, fails to teach or suggest several limitations of amended claim 30. Skee fails to teach recites an aqueous semiconductor cleaners/residue removers that 1) has a pH between about 1.5 and about 6; and 2) consists essentially of water, at least 1.5% phosphoric acid, at least 0.3% if oxalic acid, and at least 0.3% of a monofunctional organic acid. While claim 30 allows for up to 1% of a chelator, the final composition is acidic, and certainly cannot have a pH near or above 10 as disclosed in Skee.

As Skee recites alkaline cleaners, Skee expressly teaches away from an acidic composition of amended claim 30. The particular claimed ranges of the components in amended claim 30 is critical to achieving the acidic pH of the solution, which in turn achieves unexpected results of greater efficiency and enhancement in the cleaning ability of the composition. *See* specification on page 14, paragraph [0085]. The prior art can be modified as *prima facie* obvious as long as there is a reasonable expectation of success. *In re Merck & Co., Inc.*, 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986). Absent a reasonable expectation of success based on Skee, the invention of dependent claims 30 cannot be held obvious.

Thus, for the foregoing reasons, Applicants respectfully submit that the obviousness rejection of claims 30 has been overcome and respectfully request that it be reconsidered and withdrawn.

### **E. Allowable Subject Matter**

Applicants acknowledge with appreciation the allowance of claims 29, 31, 32-35.

### **F. Conclusion**

Since claims 1, 24, and 30 define subject matter that is non-obvious over Leon, Gogg, Herdt, and Skee cited in the Office Action and there is no motivation or suggestion to modify any of the references, the obviousness rejections are overcome. Accordingly, Applicants request reconsideration and allowance of independent claim 1, 24, and 30 including the dependent claims that depend therefrom, as these dependent claims incorporate all the limitations of the independent claims.

### **III. Request for Allowance**

In view of the amendments and arguments presented above, all claims are now thought to be in condition for allowance, an indication of which is solicited. In the event that any issues remain outstanding, Applicants would appreciate the courtesy of a telephone call to the undersigned counsel to resolve such issues in an expeditious manner so as to place this application in condition for allowance.

No fees are believed to be due. However, if any additional fees are determined to be due, the Commissioner is hereby authorized to charge these fees to the Morgan, Lewis & Bockius Deposit Account no. 50-0310.

Respectfully submitted,

**MORGAN LEWIS & BOCKIUS LLP**



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(filed Tuesday after  
Saturday due date and  
Monday holiday)

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